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UNITED STATES DEPARTMENT OF AGRICULTURE

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FATTENING STEERS ON VELVET BEANS

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OUTLINE OF EXPERIMENTAL WORK

Velvet beans were first considered valuable for cattle chiefly because they would eat them from vines in the field throughout the winter, even picking them off the ground and nosing them out when they were trampled in the mud. The fact that they were kept moist by rains and lying on the wet ground did not seem to affect their palatability or nutritive value. It was soon found that steers could be fattened to a considerable degree by pasturing late in the fall and early in the winter on good-yielding fields of velvet beans. (Figs. 1 and 2.)

That velvet beans are a valuable protein concentrate is indicated by the following analysis of thin-podded, speckled beans by the Bureau of Chemistry, United States Department of Agriculture:

	Per cent
Crude protein	18. 0
Crude fiber	14. 0
Nitrogen-free extract	48. 1
Ether extract	4. 3
Moisture	11. 7
Ash	3. 9

The thin-podded, speckled beans, similar to the original Florida beans, are much higher in feeding value than several varieties which have a very thick pod and consequently a low shelling percentage. The thick-podded beans also are relatively unpalatable. The popularity of these varieties, such as Osceola, rests on heavier yields and the absence of stinging fuzz.

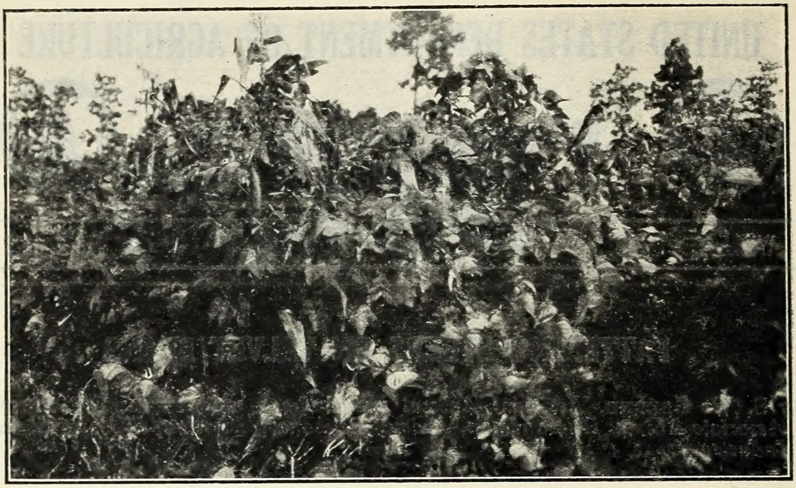

FIG. 1.—A luxuriant growth of velvet beans has practically covered the corn, which matures ahead of the beans. Velvet beans do not bear well unless they have something to grow up on

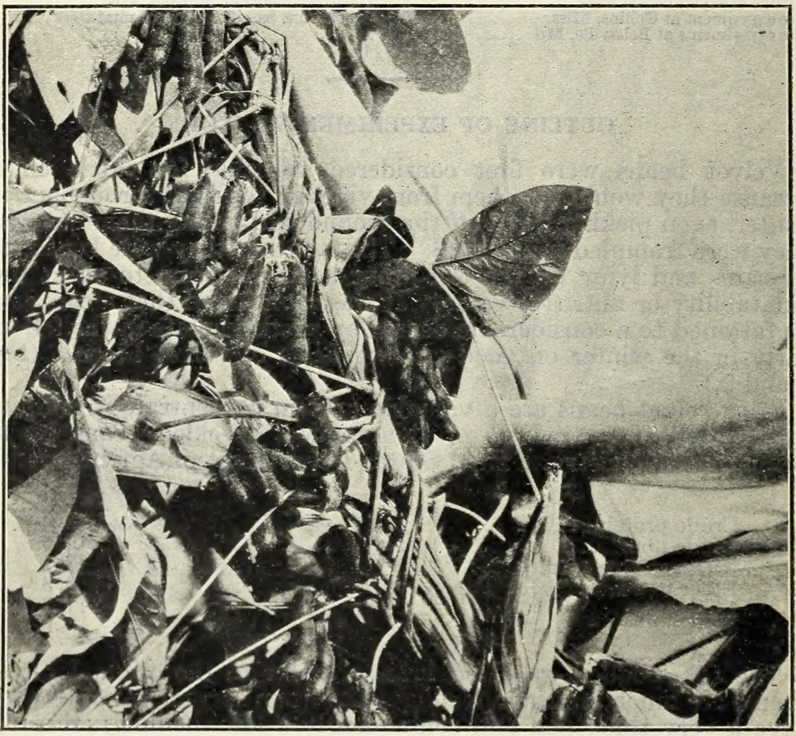

FIG. 2.—Note the luxuriant growth of pod-laden Early Speckled velvet-bean vines twined around the stalk of corn the man is holding

Air-dry Early Speckled and Osceola beans grown near McNeill, Miss. (fig. 3), yielded the following percentages of beans and hulls, by weight:

	Beans, per cent	Hulls, per cent
Early Speckled	73. 6	26. 4
Osceola	57. 8	42. 2

Since more beans are often produced than can be used advantageously as pasture, they are picked and stored for hand feeding or for sale. As no definite feeding value had been established and there was no standard market price as compared with a feed such as cottonseed meal, the market price varied greatly in different sections, according to the local opinion of their feeding value. The beans in storage became dry and hard and the question naturally arose as to whether it would pay to grind or soak them before feeding to cattle.

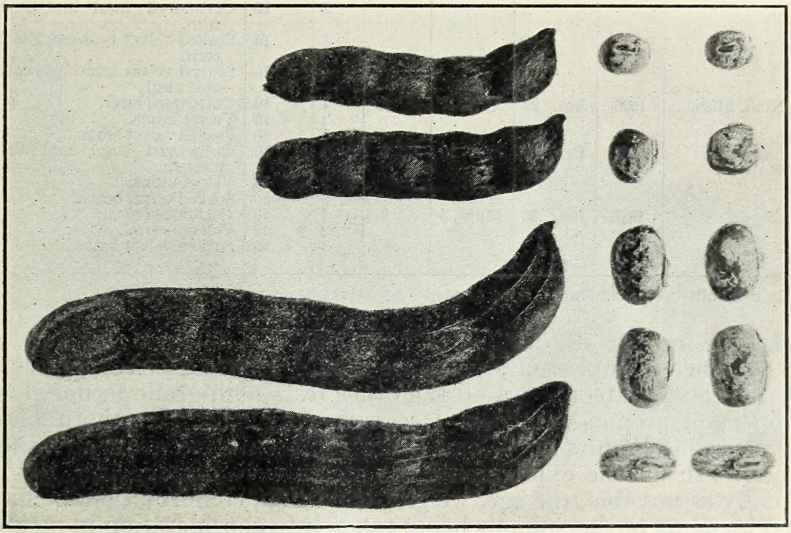

FIG. 3.—Early Speckled velvet beans (above) and Osceola velvet beans (below). Osceolas have about 50 per cent more hulls. Reduced to 59 per cent natural size

While milling companies and many practical feeders favored grinding and some favored soaking, most feeders used the beans in the pods whole and dry. In order to determine definitely the difference between and the advantages of the various methods, if any, and to study other factors in fattening steers on velvet beans, a series of experiments was started by the Animal Husbandry Division, Bureau of Animal Industry, U. S. Department of Agriculture, in 1918 and carried on as follows:

The work at the animal husbandry farm at Beltsville, Md., in 1918 and 1919 was done independently under the supervision of Frank W. Farley. The work in 1918 at Collins, Miss., was done on the farm of H. M. McIntosh. The work in 1920, 1921, and 1922 at McNeill, Miss., was done on a farm owned by the Mississippi Agricultural Experiment Station and operated by the Animal Husbandry Division. All the work in Mississippi was carried on in cooperation with the Mississippi station and was under the direct supervision of the senior writer.

Table 1 shows the location, duration, and general scheme of the experiments.

TABLE 1.—*Outline of the experimental work*

Location	Time of experiment				Steers and lots		Feeds compared
	Year	Begun	Ended	Duration	Lot No.	Steers in lot	
				Days			
Collins, Miss	1918	Jan. 1	Apr. 4	94	1	11	Velvet beans.[1]
					2	11	Ground velvet beans.
Beltsville, Md	1918	Mar. 15	July 4	112	1	10	Cottonseed meal.
					2	10	Velvet beans.
					3	10	Ground velvet beans.
					4	10	Soaked velvet beans.
	1919	Jan. 17	May 22	126	1	10	Cottonseed meal.
					2	10	Cottonseed meal and shelled corn.
					3	10	Soaked velvet beans and shelled corn.
					4	10	Soaked velvet beans and cottonseed meal.
McNeill, Miss	1920	Jan. 22	Apr. 14	84	1	10	Cottonseed meal.
					2	10	Velvet beans.
					3	10	Soaked velvet beans.
	1921	Dec. 9	Mar. 16	98	1	10	Cottonseed meal and velvet beans.
					2	10	Velvet beans.
					3	10	Soaked velvet beans.
	1922	Jan. 26	May 3	98	1	10	Cottonseed meal.
					2	10	Velvet beans.
					3	10	Soaked velvet beans.

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[1] In this bulletin "velvet beans" refers to whole, dry velvet beans in the pods.

In the feeding test at Collins, Miss., in 1918, native steers showing no evidence of improved blood were used. Figure 4 is representative of this class of steers. In all the other tests high-grade feeder steers showing a preponderance of Hereford, Angus, or Shorthorn blood were used. Figures 5, 7, and 8 are representative groups of these steers. In all the experiments the steers were divided into lots as equally as possible, the age, weight, condition, conformation, quality, and breeding of the animals being taken into consideration in making an equal division.

The steers were weighed in the morning after they had been given feed and water, the weighing being done on three successive days at the beginning and end of each experiment and the average of the three weights taken as the initial and final weights. Individual weights were taken of all steers at 14 and 28 day intervals. The feed consumed and the gains made are given by 28-day periods in this bulletin. As the duration of several of the experiments, given in Table 1, indicates, one experiment had a 10-day period and three had a 14-day period at the end. All dressing percentages are based on the weights of the steers at the stockyards shortly before they were slaughtered.

All the data will not check out exactly because fractions have been dropped to simplify and condense the tables. The calculations are based on feeds consumed, gains made, and financial returns for the whole lot in each case where data are given on the basis of one steer. The price received for silage is determined by dividing the difference between the cost of the finished cattle, excepting silage fed, and gross sale receipts by the tons of silage fed.

The concentrates and silage were divided into two equal feeds and fed morning and evening. The concentrates were mixed with the silage by hand in the troughs to prevent greedy steers from getting more than their share. The feed not consumed from one feeding to another was cleaned out of the troughs, weighed, and deducted from the total amount fed. The steers in all experiments were fed in open-sided barns with access to open lots.

The cottonseed meal fed in all experiments was bright and of good quality. The velvet beans fed were thin-podded, speckled beans, fully mature and air-dry in all experiments with the exceptions noted in the text. At Collins, Miss., in 1918, some frosted beans were fed through accident and at McNeill, Miss., in 1922, some Osceola beans were fed during the last period. All weights in the tables for soaked beans represent the air-dry weight of the beans before they were put in water.

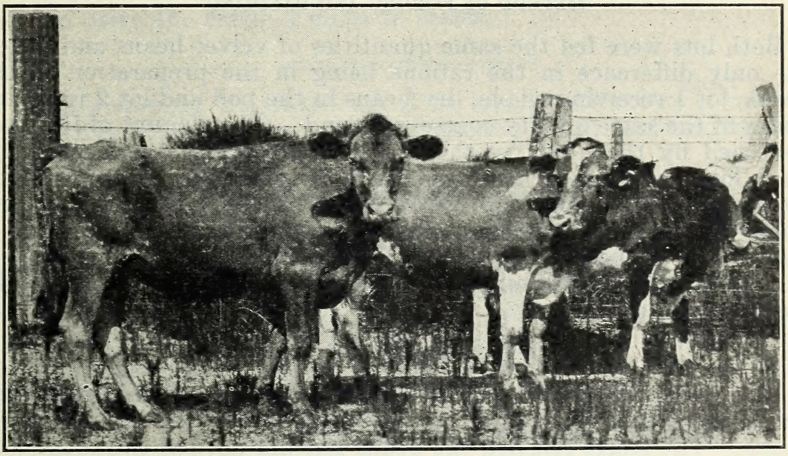

FIG. 4.—Native southern Mississippi steers such as were used in the Collins experiment

To avoid confusion in the text the lots of steers are designated according to the principal concentrate being fed instead of using numbers for each lot.

THE EXPERIMENT AT COLLINS, MISS.

The object of this experiment was to compare equal quantities of velvet beans in the pod and ground velvet beans for fattening steers, when each was fed with corn silage.

STEERS USED

Twenty-two native Mississippi steers, from 3 to 5 years old, and showing no evidence of improved beef breeding, were divided as equally as possible into two lots. On December 3, 1917, 28 days before the beginning of the experiment, they averaged 632 pounds in weight; at this time they were turned into a corn and velvet-bean field where the corn had been snapped. There were about 15 acres of velvet beans which would yield an average of 500 pounds an acre. On December 19 they were moved to a new field. They were driven 8 miles to the location of the experiment on the day before initial weights were taken. During the 28 days before beginning the experiment, the steers gained 1 pound per head per day on velvet-bean pasture.

FEEDS USED

The silage was made from corn in which a scattering stand of velvet beans was grown. The silage contained velvet beans enough to give it a brown color and make it very palatable. The velvet beans were a thin-podded, speckled variety. Ordinary air-dry velvet beans can not be satisfactorily ground to the fineness of meal in bur mills. Consequently, the beans in this test were crushed so that all beans were broken into coarse particles with some fine meal produced.

Beans crushed in this manner and stored loosely on the floors of the feed room were found to heat rapidly and it was necessary to grind a fresh supply every second day to prevent the feed from molding.

METHOD OF FEEDING AND HANDLING

Both lots were fed the same quantities of velvet beans and silage, the only difference in the rations being in the preparation of the beans, lot 1 receiving whole, dry beans in the pod and lot 2 receiving beans of the same quality coarsely ground. The amount of feed was governed by the quantity the less hearty feeders would clean up. Each lot was fed under an open-side barn with a barn space of 16 by 50 feet and a lot space 50 by 50 feet. As the lots were new and unpaved the ground became very muddy at times. On account of the burning of the barn and scales the only final weight obtainable was that taken at the shipping point 5 miles from the barn where the steers were fed.

OBSERVATIONS DURING THE EXPERIMENTS

The steers fed whole velvet beans in pods relished them much better and would have eaten more than the steers fed ground velvet beans. The steers relished the beans but did not eat the silage well until the latter part of the first period. Even then they did not eat it greedily. Previous to the experiment only one steer from each lot had ever tasted silage. In the ground-bean lot there were two very poor eaters. During the first period the weather was very severe; there was rain and a freezing temperature for two days, covering the feed lots with a sheet of ice. The temperature fell to 7° F.

During the second period the velvet beans were increased as rapidly as the steers would clean them up; consequently, the silage was reduced. During the third period both lots were "off feed" on account of immature and frosted beans. These beans appeared all right on the outside but were moldy inside the hulls. At the end of the first half of the third period mature beans were secured. The steers had made practically no gains on the immature beans, but began to gain soon after the mature beans were fed.

On April 1 the barns and silos were burned. A carload of hay was ordered at once and the steers were fed native hay for three days. As the farm scales were destroyed by fire the steers were driven 5 miles to the loading point and final weights were taken there. There was necessarily some shrinkage, so that the weights showed practically no gain during the last 10 days. The steers were driven to Collins late in the evening, April 4, and loaded the next morning about 6 o'clock. They had no feed after they left the farm and drank very little water.

While it was planned to carry the steers longer, they were quite well finished for that class of steers, as their dressing percentages indicate.

QUANTITIES OF FEED CONSUMED

The two lots were fed as nearly as possible the same quantities of feed. It was, however, not possible to get the ground-bean lot to eat so much as the whole-bean lot would have eaten.

GAINS IN WEIGHT

As Table 2 shows, the whole-bean lot made only a slightly larger gain than the ground-bean lot. By periods, the whole-bean lot made greater gains than the ground-bean lot in all excepting the second period. The gains during the fourth period would have shown to much better advantage had it not been necessary, on account of the fire, to drive the cattle 5 miles to scales.

HOGS FOLLOWING STEERS

Hogs following the steers failed to make satisfactory gains. In fact, those following the steers fed ground beans lost weight when the steers were on full feed.

SALE AND SLAUGHTER OF CATTLE

The shrinkage in transit was unusually heavy. They were unloaded at the National Stock Yards, East St. Louis, Ill., about 8 a. m., April 8, having been in transit about 72 hours. Their sale for 12 cents a pound broke the record for native southern cattle at a northern market. However, a lot of well-bred beef steers weighing 1,247 pounds each, topped the market for the same day at $15.25 per 100 pounds. No slaughter data were obtained.

SUMMARY OF COLLINS EXPERIMENT

Grinding velvet beans to fatten steers increased the cost of the beans considerably, decreased their palatability, and did not increase their efficiency in making gains.

A full feed ration of 1 part velvet beans and 3 parts corn silage made a satisfactory ration for fattening steers.

Hogs following steers fed velvet beans did not make satisfactory gains without additional feed.

Tables 2, 3, and 4 show various details of the experiment.

TABLE 2.—*Average and total gains of steers in Collins, Miss., experiment*

Lots and feeds	Gains by periods [1]					Daily gains				
	First period	Second period	Third period	Fourth period	Total gain	First period	Second period	Third period	Fourth period	Average, 94 days
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Lot 1: Whole velvet beans	38	59	34	2	133	1.4	2.1	1.2	0.2	1.41
Lot 2: Ground velvet beans	29	72	28	0	129	1.0	2.6	1.0	0.0	1.37

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[1] The first three periods were 28 days each, the fourth 10 days.

TABLE 3.—*Total feed consumed per lot and daily feed per steer by periods* [1]

Lots and feeds	Total feed per lot					Daily feed per steer				
	First period	Second period	Third period	Fourth period	Total, 94 days	First period	Second period	Third period	Fourth period	Average, 94 days
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Lot 1: Whole velvet beans	1,968	2,530	3,320	1,228	9,046	6.4	8.2	10.8	11.2	8.7
Corn silage	6,782	8,811	7,534	1,790	24,917	22.0	28.6	24.5	16.3	24.1
Lot 2: Ground velvet beans	1,968	2,480	3,205	1,216	8,869	6.4	8.0	10.4	11.1	8.6
Corn silage	6,778	8,658	7,363	1,738	24,537	22.0	28.1	23.9	15.8	23.7

[1] The first three periods were 28 days each, while the fourth was 10 days.

TABLE 4.—*Summary of feeds consumed, gains, costs,* [1] *and marketing data*

Item	Lot 1. Whole beans	Lot 2. Ground beans
Number of steers	11	11
Days	94	94
Average daily ration:		
Corn silage, pounds	24.1	23.7
Whole velvet beans, do	8.7	----------
Ground velvet beans, do	----------	8.6
Total feed consumed per steer:		
Corn silage, do	2,265	2,231
Whole velvet beans, do	822	----------
Ground velvet beans, do	----------	806
Feed per 100 pounds gain:		
Corn silage, do	1,703	1,729
Whole velvet beans, do	618	----------
Ground velvet beans, do	----------	625
Initial weight per steer, do	660	660
Final weight per steer, do	793	789
Total gain per steer, do	133	129
Daily gain per steer, do	1.41	1.37
Cost of feed per steer, dollars	15.94	17.27
Cost of gains per 100 pounds, do	11.99	13.39
Initial value per 100 pounds, do	7.54	7.54
Necessary selling price to break even, do	10.19	10.42
Actual selling price, do	12.00	12.00
Expense of marketing per steer, do	7.07	7.07
Profit per steer, do	12.91	11.22
Shrinkage to market, pounds	79	78
Dressing percentage, per cent	55.2	56.1
Price received per ton for silage, dollars	16.40	15.06

[1] Prices per ton of feed used: Corn silage, $5; whole velvet beans, $25; ground velvet beans, $29.

THE EXPERIMENTS AT BELTSVILLE, MD.

THE 1918 EXPERIMENT

The object of the experiment conducted in 1918 was to compare the following feeds when fed with corn silage and dry roughage for fattening steers: Cottonseed meal, velvet beans, ground velvet beans, and soaked velvet beans.

STEERS USED

Forty 2-year old steers raised in Illinois and Missouri, predominating in Shorthorn blood, with a little Angus and Hereford blood evident, in good condition for feeders and averaging 797 pounds per head, were bought at the National Stock Yards, East St. Louis, Ill., February 22, 1918, at $10.75 per 100 pounds. They arrived at Beltsville, Md., March 1, and were divided into four lots of 10 each, the lots being as nearly uniform as possible.

During a preliminary period of two weeks the steers were allowed to rest, obtain a normal fill, and become accustomed to the feeds to be used in the experiment. During the first week all the steers were fed together, while during the second week after they had been divided into lots they were fed the same feeds as in the experiment.

The average cost of the steers on March 15 was $11.84 per 100 pounds, which includes the commission for purchasing, shipping charges, feed en route, and the value of the feed consumed during the preliminary period. A commission man from Baltimore appraised each lot as follows: Lots 2 and 3 were put at the same price, lot 1, 15 cents less, and lot 4, 20 cents less per hundredweight than lots 2 and 3.

FEEDS USED

The feeds used in this experiment were charged at their actual cost on the farm. Corn stover produced on the farm was used during the first 28-day period. It was replaced by wheat straw of good quality during the rest of the experiment. As about half the silage was made from good-quality, well-ripened corn, whereas the other half was made from immature corn, the quantity of corn per ton was estimated at 4 bushels. Allowing $1.35 a bushel for the corn in the field, 5 cents less than the farm price of corn for Maryland on December 1, 1917, $4 a ton for 280 pounds of corn stover in the field, equivalent in weight to the 4 bushels of ear corn, and $1.50 a ton for putting up the silage, the cost per ton was practically $7.50.

METHOD OF FEEDING AND HANDLING THE CATTLE

The feed yards were 41 feet wide and 132 feet long, with two open-front sheds 24 feet deep along the north side. The two sheds were separated by a 12-foot silo of 80 tons' capacity. The feed yards were not paved, but fairly good drainage prevented them from becoming very muddy even in long periods of rainy weather.

The dry roughage was fed in racks inside the sheds. The silage and concentrates were fed in flat-bottomed bunks placed in the open feed lots. Each yard was provided with a steel trough which contained water at all times. The steers were given free access to rock salt.

OBSERVATIONS DURING EXPERIMENT

The cattle in lot 1, the cottonseed-meal lot, cleaned up their feed more readily than those in any of the other lots. The dry beans were fairly palatable. During the first and second periods considerable difficulty was experienced in getting the ground-bean lot to clean up the beans. The beans were tried both finely and coarsely ground, the coarsely ground beans being more palatable. As in the work at Collins, the ground beans became hot and molded very easily; consequently the beans were ground at frequent intervals. The soaked beans were very palatable.

During the latter part of the first period there were very heavy rains followed by sleet and snow. During the second period one steer in the cottonseed-meal lot was off feed for a day. During the second and third periods one steer in the soaked-bean lot was slightly lame on account of having been pushed into a manger by another steer, but he kept on eating normally.

QUANTITIES OF FEED CONSUMED

It was desired that the quantities of feed and digestible nutrients be kept as nearly equal as possible. However, with equal rations of silage, dry roughage, and protein, the quantities of dry matter were unequal because more velvet beans than cottonseed meal were required to supply a certain quantity of protein. Then the steers fed dry beans, whole and ground, would not eat beans enough to get as much protein as the cottonseed-meal lot. On the other hand, the steers fed soaked beans would eat beans enough but not silage enough to make their ration comparable with the cottonseed-meal lot. As a rule the steers cleaned up the silage first and left the beans. By feeding the beans first and the silage an hour later, when most of the beans had been eaten, it was possible to get the cattle to eat a little more of the beans.

The cottonseed-meal lot ate considerably more silage than any of the other lots and also consumed a little more dry roughage. The whole-bean lot and the ground-bean lot consumed practically equal quantities of silage and dry roughage, but the ground-bean lot would not eat nearly so much of the beans as the whole-bean lot. The soaked-bean lot ate considerably more beans than the other bean lots and consequently less silage.

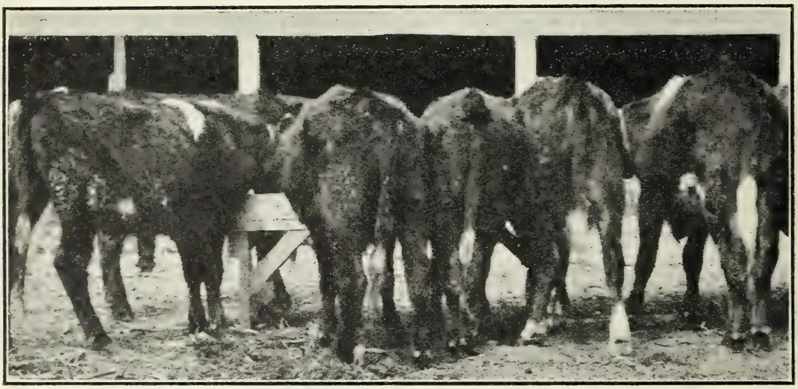

FIG. 5.—Steers fed on whole dry velvet beans at the beginning of the experiment at Beltsville, Md., in 1918

GAINS IN WEIGHT

The cottonseed-meal lot made the greatest gains. Of the steers fed on velvet beans, the soaked-bean lot produced the largest gain, the dry-bean lot next, and the ground-bean lot the least.

Throughout the experiment the steers gained in weight quite uniformly. Each lot made the greatest gain during the second period and the next larger gain in the third period.

The steers as they appeared respectively at the beginning and at the end of the experiment are shown in Figures 5 and 6.

HOGS FOLLOWING CATTLE

Hogs, averaging 86 pounds at the beginning of the experiment, were kept in each pen. As no additional feed was given them and as they obtained very little corn from the silage, their gains were very small. In the dry velvet-bean and soaked velvet-bean lots they are worthy of consideration, the pork credit being 8.3 and 10.9 pounds per steer, respectively.

SALE AND SLAUGHTER OF CATTLE

The cattle were sold competitively on the basis of farm weights, and shipped by rail from the Beltsville farm to Baltimore, a distance of about 27 miles. They were in the Baltimore yards two days before being slaughtered, during which time they were given only mixed hay. On the day they were slaughtered each lot was weighed to determine the shrinkage from farm weight and the dressing percentage. Records were made of the various parts obtained in slaughtering, as shown in Table 9.

The cottonseed-meal lot showed the most finish at the end of the experiment and brought the highest price. The cattle in this lot at the beginning of the experiment were valued at 15 cents a hundredweight less than the cattle in the whole-bean and ground-bean lots. The soaked-bean lot showed the next best finish so far as covering of fat was concerned. At the beginning of the experiment the cattle in this lot were valued at 20 cents less than the cattle in either of the other bean lots and 5 cents less than the cattle of the cottonseed-meal lot.

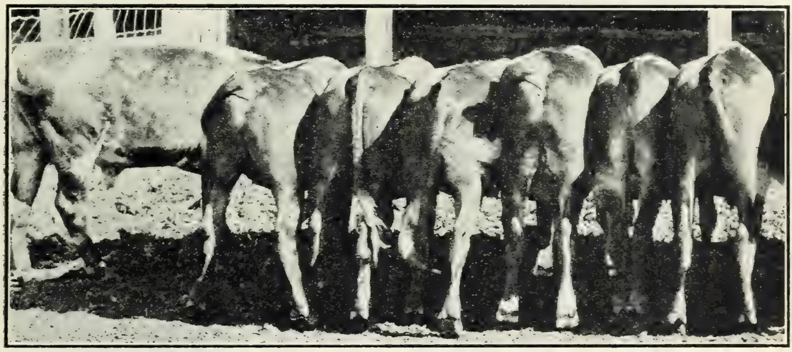

FIG. 6.—Steers fed on whole dry velvet beans at the end of the experiment at Beltsville, 1918. They gained 194 pounds per head in 112 days

The soaked-bean lot dressed out the highest percentage, while the whole-bean lot was second, cottonseed-meal lot third, and ground-bean lot fourth. The amount of internal fat was largest in the soaked-bean lot, which had the highest dressing percentage, and least in the ground-bean lot, which had the lowest dressing percentage. The carcasses of the soaked-bean lot and cottonseed-meal lot were of nearly the same quality, the soaked-bean lot being slightly better. The whole-bean lot was considerably better than the ground-bean lot on account of the greater covering of fat.

SUMMARY OF 1918 EXPERIMENT

The cottonseed-meal lot produced the largest and cheapest gain and the greatest profit.

Of the three forms of beans, the soaked beans were the most palatable, while whole beans were more palatable than ground beans.

The soaked beans also produced more economical gains than the whole or ground beans. Whereas more soaked beans were required per 100 pounds of gain, considerably less silage was consumed; consequently, the cost per 100 pounds gain was least for the soaked beans. More of the dry beans than of ground beans were required to produce 100 pounds. However, on account of the greater quantity of silage consumed with the ground beans and the cost of grinding them, the gain produced by the dry beans cost less than the gain made by the steers fed ground beans.

The greatest disadvantage of the ground beans was the small quantity consumed and the consequent small gain, which resulted in a poor finish and a selling price practically $1 per 100 pounds lower than that of the other lots. There was, consequently, a loss on the ground-bean lot while all the other rations produced a profit.

Although the gains made by hogs were small for all lots, considerably larger gains were made from the whole-bean and soaked-bean lots than from the ground-bean and cottonseed-meal lots.

Corn silage and velvet beans form a satisfactory fattening ration.

Tables 5 to 9, inclusive, show various data relating to this experiment.

TABLE 5.—*Average gains per steer, by periods, total, and daily*

Lots and feeds	Gains by periods					Daily gains				
	First period	Second period	Third period	Fourth period	Total gain	First period	Second period	Third period	Fourth period	Average, 112 days
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Lot 1: Cottonseed meal	56	77	72	52	257	2.0	2.7	2.6	1.8	2.3
Lot 2: Dry velvet beans	32	79	49	34	194	1.1	2.8	1.7	1.2	1.7
Lot 3: Ground velvet beans	22	72	53	25	172	0.8	2.6	1.9	0.9	1.5
Lot 4: Soaked velvet beans	43	77	62	41	223	1.5	2.7	2.2	1.4	2.0

TABLE 6.—*Total feed consumed per lot and daily feed per steer by periods*[1]

Lots and feeds	Total feed per lot					Daily feed per steer				
	First period	Second period	Third period	Fourth period	Total, 112	First period	Second period	Third period	Fourth period	Average, 112 days
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Lot 1:										
Cottonseed meal	728	1,240	1,360	1,595	4,923	2.6	4.4	4.9	5.7	4.4
Corn stover and wheat straw	5,450	990	935	995	8,370	19.5	3.5	3.3	3.6	7.5
Corn silage	5,020	9,450	11,000	12,300	37,770	17.9	33.7	39.3	43.9	33.7
Salt	50	26	22	12	110	.2	.1	.1	(2)	.1
Lot 2:										
Dry velvet beans	1,758	2,124	2,151	2,473	8,506	6.3	7.6	7.7	8.8	7.6
Corn stover and wheat straw	5,450	860	840	940	8,090	19.5	3.1	3.0	3.4	7.2
Corn silage	5,020	8,250	8,400	8,400	30,070	17.9	29.5	30.0	30.0	26.8
Salt	50	24	23	13	110	.2	.1	.1	(2)	.1
Lot 3:										
Ground velvet beans	1,394	1,559	2,039	1,584	6,576	5.0	5.6	7.3	5.7	5.9
Corn stover and wheat straw	5,450	850	840	1,050	8,190	19.5	3.0	3.0	3.7	7.3
Corn silage	5,020	8,250	8,400	8,475	30,145	17.9	29.5	30.0	30.3	26.9
Salt	50	33	16	17	116	.2	.1	.1	.1	.1
Lot 4:										
Soaked velvet beans	1,820	2,709	3,065	3,178	10,772	6.5	9.7	10.9	11.4	9.6
Corn stover and wheat straw	5,450	855	840	940	8,085	19.5	3.1	3.0	3.4	7.2
Corn silage	5,020	7,200	7,000	7,000	26,220	17.9	25.7	25.0	25.0	23.4
Salt	50	22	28	3	103	.2	.1	.1	(2)	.1

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[1] The quantities of dry roughage includes the unconsumed stover and straw listed in Table 7. The same applies to Table 8.

[2] Less than 0.1 pound.

TABLE 7.—*Quantities of dry roughage, not eaten, weighed and used for bedding*

	Lot 1	Lot 2	Lot 3	Lot 4
First period	2,829	2,587	2,769	3,054
Second period	244	256	325	303
Third period	256	295	247	294
Fourth period	336	302	259	265

TABLE 8.—*Summary of feeds consumed, gains, costs,*[1] *and marketing data (1918)*

Item	Lot 1, cottonseed meal	Lot 2, whole dry velvet beans	Lot 3, dry ground velvet beans	Lot 4, soaked whole velvet beans
Number of steers	10	10	10	10
Days	112	112	112	112
Average daily ration:				
Cottonseed meal ... pounds	4.4	--------	--------	--------
Velvet beans ... do	--------	7.6	5.9	9.6
Corn stover and wheat straw ... do	7.5	7.2	7.3	7.2
Corn silage ... do	33.7	26.8	26.9	23.4
Total feed consumed per steer:				
Cottonseed meal ... do	492	--------	--------	--------
Velvet beans ... do	--------	851	658	1,077
Corn stover and wheat straw ... do	837	809	819	808
Corn silage ... do	3,777	3,007	3,014	2,622
Feed per 100 pounds gain:				
Cottonseed meal ... do	192	--------	--------	--------
Velvet beans ... do	--------	439	382	482
Corn stover and wheat straw ... do	326	417	476	363
Corn silage ... do	1,470	1,550	1,753	1,176
Initial weight per steer ... do	777	786	773	772
Final weight per steer ... do	1,034	980	945	995
Total gain per steer ... do	257	194	172	223
Daily gain per steer ... do	2.3	1.7	1.5	2.0
Cost of feed per steer ... dollars	32.16	28.62	26.84	31.71
Cost of gain per 100 pounds ... do	12.51	14.75	15.60	14.22
Initial value per 100 ... do	11.78	11.93	11.93	11.73
Necessary selling price ... do	11.96	12.49	12.60	12.29
Actual farm selling price ... do	13.62	13.11	12.47	13.52
Profit per steer excluding pork ... do	17.17	6.06	−1.24	12.29
Profit per steer, including pork[2] ... do	17.27	7.31	−.76	13.92
Pork produced per steer ... pounds	.7	8.3	3.2	10.9
Shrinkage to market per steer ... do	74	68	68	60
Dressing percentage	54.2	54.9	54.0	55.8
Price received per ton for silage	16.60	11.54	6.68	16.87

[1] Cost per ton of feeds used: Velvet beans, $33; ground velvet beans, $37; soaked velvet beans, $34.50; cottonseed meal, $59; corn silage, $7.50; corn stover, $6; wheat straw, $12; salt, $16.

[2] Pork valued at $15.32 per 100 pounds live weight.

TABLE 9.—*Weights of live steers, carcasses, and parts of the offal*

	Live weight	Dressed weight[1]	Heads	Hearts	Livers	Lungs	Spleens	Tongues	Hides	Ruffle, caul, and paunch fat
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Lot 1	9,595	5,196.94	241.25	40.50	113.0	79.5	19.00	66.75	729	325
Lot 2	9,125	5,006.82	232.50	39.00	93.0	71.0	18.00	62.75	654	321
Lot 3	8,775	4,739.28	232.00	42.25	90.5	69.5	18.75	62.25	647	305
Lot 4	9,350	5,214.58	237.50	44.00	99.5	71.5	20.00	68.75	704	335
Total	36,845	20,157.62	943.25	165.75	396.0	291.5	75.75	260.50	2,734	1,286
Per cent of live weight	--------	54.71	2.56	.45	1.07	.79	.20	.71	7.42	3.49

[1] The dressed weights given here were obtained by deducting 2 per cent from the warm weights of the carcasses.

THE 1919 EXPERIMENT AT BELTSVILLE, MD.

The object of this experiment was to compare cottonseed meal and soaked velvet beans with and without the addition of corn when fed with corn silage and wheat straw.

STEERS USED

Forty "long-yearling" steers, averaging 769 pounds, were bought on the East St. Louis market, for $12.25 per 100 pounds. (Fig. 7.) They were good feeders of mixed breeding, with Angus and Shorthorn blood predominating, and had been raised in the Corn Belt. They arrived at Beltsville three days before the experiment was started. When the experiment was begun they averaged 731 pounds and cost $13.80 per 100 pounds including freight charges and feed. All lots had the same initial value at the beginning of the experiment.

FIG. 7.—Representative steers of the 40 head fed at Beltsville in 1919

METHOD OF FEEDING AND HANDLING THE STEERS

The same feeding equipment was used as in the year previous, and the feeding was done in much the same manner. A full feed of corn silage was given and wheat straw was kept before the cattle.

OBSERVATIONS DURING EXPERIMENT

There was no appreciable difference in the palatability of the rations given to the cottonseed-meal lots or the soaked velvet-bean-corn lot, but the ration of soaked velvet beans first fed to lot 4 was much less palatable. At the end of 70 days' feeding the steers were doing so poorly, because they refused to eat the soaked beans, that on March 28 cottonseed meal was added to the ration as an appetizer. Thereafter the cattle did considerably better, and the amount of beans consumed was gradually increased. The soaked velvet beans with corn were readily eaten by lot 3.

QUANTITY OF FEED CONSUMED

Lot 1 was started on a very small quantity of cottonseed meal, which was gradually increased until, toward the end of the experiment, the steers were eating daily 7 pounds per head.

Lot 2 was given a medium allowance of cottonseed meal and about a half feed of shelled corn.

The amounts of corn given to the cottonseed-meal-corn lot and the soaked velvet-bean-corn lot were identically the same. While a full feed of silage was given to all lots, the cattle in the soaked velvet-bean-corn lot ate considerably less silage than those in the cottonseed-meal and cottonseed-meal-corn lots on account of the large amount of roughage supplied by the hulls of the velvet beans.

Lot 4, fed soaked velvet beans and cottonseed meal, ate more silage than the soaked velvet-bean-corn lot, but not enough more to balance the much greater quantity of concentrates eaten by the latter.

GAINS IN WEIGHT

The gains during the first period were large because the experiment was begun without giving the cattle a chance to fill after their long trip from East St. Louis. During the second and third periods the gains were fair, though rather irregular, but during the fourth period the gains were uniformly large. The corn-fed lots (2 and 3) made larger and more uniform gains than the lots fed cottonseed meal and velvet beans (1 and 4).

HOGS FOLLOWING STEERS

In the cottonseed-meal and velvet-bean lots only one shote was used, while in the corn-fed lot additional shotes were added as they were needed. At the end of the experiment each of these lots contained five pigs. The pigs varied considerably in weight, but averaged about 135 pounds when put in. They received no feed except that contained in the droppings of the steers.

In the cottonseed-meal lot the gains were so small that it would not pay to have a pig following the steers. As the small gain consisted of growth only, the hog was worth less per pound at the end of the experiment than at the beginning. In other lots the hog gains were not large, but they were worth while.

SALE AND SLAUGHTER OF CATTLE

The cattle were sold at Beltsville by a commission man from Baltimore to the highest bidder of several Washington provision men. The corn-fed lots showed the best finish and brought the highest prices, the soaked velvet-bean-corn lot being slightly fatter than the cottonseed-meal-corn lot. There was not much difference between the cottonseed-meal and the cottonseed-meal-corn lots. Lot 4, fed soaked beans and a little cottonseed meal, had the poorest finish.

The dressing percentages and other data were obtained on the cattle in each lot when they were slaughtered, at Benning, D. C. The soaked velvet-bean-corn lot, which brought the highest price, had the highest dressing percentage; the cottonseed-meal lot was second; the cottonseed-meal-corn lot third; and the soaked velvet-bean-cottonseed-meal lot last. The dressing percentages based on Benning weights are very similar. There was no material difference between the dressed carcasses of the cottonseed meal, cottonseed-meal-corn, and soaked velvet-bean-corn lots except that the cottonseed-meal lot carried about 100 pounds more tallow.

SUMMARY OF 1919 EXPERIMENT

The addition of corn to a concentrate ration of either cottonseed meal or soaked velvet beans increased the amount of concentrates required to make 100 pounds gain, increased the cost of the gain, and did not increase the selling price sufficiently to overcome the increased cost.

In comparing cottonseed meal and velvet beans on the basis of the results of the cottonseed-meal-corn lot and the soaked velvet-bean-corn lot, it is evident that 1 pound of cottonseed meal is practically equal to 2 pounds of velvet beans. This lot made the smallest gains and sold at the lowest price, but since it made the cheapest gains it showed the smallest financial loss when the pork produced is taken into consideration. This indicates that large gains and high finish are not always necessary for financial success in cattle feeding. On account of the addition of cottonseed meal to the soaked velvet-bean ration in lot 4, it is not directly comparable to any of the other lots.

A combination of feeds undoubtedly increases the palatability of the less palatable feeds to some extent. In lot 4 the addition of a small quantity of cottonseed meal during the second half of the experiment resulted in a greater consumption of the soaked beans.

Tables 10 to 13, inclusive, show the results of the feeding.

TABLE 10.—*Average gains per steer by periods and daily*

Lots and feeds	Gains by periods						Daily gains					
	First period	Second period	Third period	Fourth period	Fifth period	Total gain	First period	Second period	Third period	Fourth period	Fifth period	Average, 126 days
	Lbs.	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
Lot 1: Cottonseed meal	104	46	26	88	33	297	3.7	1.6	0.9	3.1	2.4	2.36
Lot 2: Cottonseed meal and shelled corn	85	53	67	85	17	307	3.0	1.9	2.4	3.0	1.2	2.44
Lot 3: Velvet beans and shelled corn	82	75	48	65	37	307	2.9	2.7	1.7	2.3	2.6	2.44
Lot 4: Velvet beans and cottonseed meal	61	38	48	75	45	267	2.2	1.4	1.7	2.7	3.2	2.12

TABLE 11.—*Total feed consumed per lot and daily feed per steer by periods*

Lots and feeds	Total feed per lot						Daily feed per steer					
	First period	Second period	Third period	Fourth period	Fifth period	Total, 126 days	First period	Second period	Third period	Fourth period	Fifth period	Average, 126 days
Lot 1:	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*	*Lbs.*
Cottonseed meal	869	1,176	1,464	1,771	1,015	6,295	3.1	4.2	5.2	6.3	7.2	5.0
Corn silage	8,585	11,410	12,320	12,370	7,150	51,835	30.7	40.7	44.0	44.2	51.0	41.1
Wheat straw	850	390	400	324	224	2,188	3.0	1.4	1.4	1.2	1.6	1.7
Salt	29	15	24	22	6	96	.1	.1	.1	.1	------	.1
Lot 2:												
Cottonseed meal	575	841	896	896	484	3,692	2.1	3.0	3.2	3.2	3.5	2.9
Shelled corn	1,123	1,788	2,143	2,595	1,690	9,339	4.0	6.4	7.7	9.3	12.1	7.4
Corn silage	5,932	7,240	9,180	11,290	4,990	38,632	21.2	25.9	32.8	40.3	35.6	30.7
Wheat straw	850	410	400	300	175	2,135	3.0	1.5	1.4	1.1	1.2	1.7
Salt	30	17	30	21	8	106	.1	.1	.1	.1	.1	.1
Lot 3:												
Velvet beans	1,232	1,784	1,820	1,902	1,085	7,823	4.4	6.4	6.5	6.8	7.7	6.2
Shelled corn	1,123	1,788	2,143	2,595	1,690	9,339	4.0	6.4	7.7	9.3	12.1	7.4
Corn silage	5,932	7,210	8,055	7,650	2,980	31,827	21.2	25.7	28.8	27.3	21.3	25.3
Wheat straw	850	410	400	300	224	2,184	3.0	1.5	1.4	1.1	1.6	1.7
Salt	16	33	30	15	12	106	.1	.1	.1	.1	.1	.1
Lot 4:												
Velvet beans	1,865	2,655	2,260	2,430	1,690	10,900	6.7	9.5	8.1	8.7	12.1	8.6
Corn silage	5,992	7,160	7,960	9,375	5,040	35,527	21.4	25.6	28.4	33.5	36.0	28.2
Wheat straw	850	420	400	300	175	2,145	3.0	1.5	1.4	1.1	1.2	1.7
Salt	26	29	39	19	13	126	.1	.1	.1	.1	.1	.1
Cottonseed meal	------	------	285	700	432	1,417	------	------	[1] 2.0	2.5	3.1	1.1

[1] Cottonseed meal was fed during the last half of the period.

TABLE 12.—*Summary of feed consumed, gains, costs,[1] and marketing data (1919)*

Item	Lot 1: Cottonseed meal	Lot 2: Cottonseed meal and shelled corn	Lot 3: Soaked velvet beans and shelled corn	Lot 4: Soaked velvet beans and cottonseed meal
Number of steers	10	10	10	10
Days	126	126	126	126
Average daily ration:				
Cottonseed meal ... pounds	5.0	2.9	----------	1.1
Shelled corn ... do	----------	7.4	7.4	----------
Velvet beans ... do	----------	----------	6.2	8.6
Corn silage ... do	41.1	30.7	25.3	28.2
Wheat straw ... do	1.7	1.7	1.7	1.7
Total feed consumed per steer:				
Cottonseed meal ... do	629	369	----------	142
Shelled corn ... do	----------	934	934	----------
Velvet beans ... do	----------	----------	782	1,090
Corn silage ... do	5,183	3,863	3,183	3,553
Wheat straw ... do	219	213	218	214
Feed consumed per 100 pounds gain:				
Cottonseed meal ... do	212	120	----------	53
Shelled corn ... do	----------	304	304	----------
Velvet beans ... do	----------	----------	255	408
Corn silage ... do	1,745	1,258	1,037	1,331
Wheat straw ... do	74	70	71	80
Initial weight per steer ... do	726	735	732	732
Final weight per steer ... do	1,023	1,042	1,039	999
Total gain per steer ... do	297	307	307	267
Daily gain per steer ... do	2.36	2.44	2.44	2.12
Cost of feed per steer ... dollars	48.00	57.10	55.13	42.66
Cost of gain per 100 pounds ... do	16.16	18.60	17.96	15.98
Initial value per 100 pounds ... do	13.80	13.80	13.80	13.80
Necessary selling price ... do	14.49	15.21	15.03	14.38
Actual selling price ... do	14.24	14.42	14.57	14.04
Loss per steer, excluding pork ... do	2.53	8.31	4.74	3.45
Loss per steer, including pork[2] ... do	2.29	4.64	.95	2.18
Pork produced per steer ... pounds	1.4	21.6	22.3	7.5
Shrinkage to slaughterhouse ... do	68	72	63	62
Dressing percentage ... per cent	57.6	57.1	57.8	56.6
Price received per ton for silage ... dollars	9.02	5.70	7.02	8.06

[1] Cost of feeds used: Cottonseed meal, $65 per ton; corn silage, $10 per ton; wheat straw, $14 per ton; salt, $20 per ton; soaked velvet beans, $34.25 per ton; shelled corn, $1.45 per bushel.

[2] Pork produced valued at $17 per 100 pounds, live weight.

TABLE 13.—*Weights of live steers, carcasses, and parts of the offal*

	Live weight	Dressed weight[1]	Heads	Hearts	Livers	Lungs	Tongues	Hides	Ruffle, caul, and paunch fat
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Lot 1	9,550	5,502.7	208.25	36.00	111.25	99.50	62.75	692	335
Lot 2	9,700	5,537.0	190.25	38.25	114.00	101.25	60.25	702	340
Lot 3	9,765	5,644.8	194.75	40.75	115.50	100.50	62.00	721	435
Lot 4	9,375	5,310.9	195.25	36.00	113.50	97.25	61.25	666	310
Total	38,390	21,995.4	788.50	151.00	454.25	398.50	246.25	2,781	1,420
Per cent of live weight	--------	57.29	2.05	0.39	1.18	1.04	0.64	7.25	3.70

[1] The dressed weights given here were obtained by deducting 2 per cent from the warm weights of the carcasses.

THE EXPERIMENTS AT McNEILL, MISS.

The purpose of these experiments (1920–1922) was:

To compare whole dry velvet beans with whole soaked velvet beans for fattening steers.

To determine the relative value of cottonseed meal and velvet beans when fed with silage for fattening steers.

To determine the advantage of supplementing velvet beans and sorghum silage with cottonseed meal for fattening steers.

THE 1920 EXPERIMENT

The object of this experiment was to compare the following feeds when fed with corn silage to fatten steers:

Lot 1. Cottonseed meal.
Lot 2. Dry velvet beans.
Lot 3. Soaked velvet beans.

STEERS USED

Thirty high-grade 3-year-old feeder steers showing a preponderance of Hereford, Angus, and Shorthorn blood were purchased in northern Mississippi. They were selected for uniformity from a herd of 200. Previous to purchase they had been run on stalk fields. After a fill of hay and water at McNeill the average weight on January 8 was 780 pounds.

METHOD OF FEEDING AND HANDLING THE STEERS

The silage for all lots was made from fully matured corn of the same variety and planted in the same manner as for grain. Considerable water was added as the corn went into the silo. The silage was bright and of good quality as a whole, but some spoilage occurred around the walls of the silo. The beans fed lot 3 in this experiment were soaked 12 hours before feeding.

Beginning January 8 and continuing two weeks all lots were fed a limited ration of cottonseed meal and corn silage as a preliminary feed. The cost of this feed was included in the initial cost of the steers and no other account is taken.

OBSERVATIONS DURING EXPERIMENT

During the first period all the lots were slightly off feed and scoured badly. This was taken into account immediately and the quantities of silage fed were reduced until the steers were normal again. One steer in the cottonseed-meal lot was so badly injured in a fight that he had to be fed separately for several days. As one steer in the soaked velvet-bean lot was scouring very badly, he was given a 2-pound dose of Epsom salt, following which he recovered rapidly. In spite of being off feed the steers of all lots made very high gains during the period.

During the second period one steer in the dry velvet-bean lot was very lame for several days on account of a nail in one of his feet. In the soaked velvet-bean lot two steers lost weight whereas two made no gains. The others made good gains. Several steers, on account of spoiled silage, were scouring a little at the end of the period. It was necessary to use the spoiled silage on account of the limited quantity of silage available for finishing the steers.

FEED CONSUMED

The quantities of feed consumed increased throughout the experiment excepting the silage fed to the velvet-bean lots which was smaller in the second and third periods than in the first. The velvet-bean lots were fed practically the same quantities of silage and velvet beans.

GAINS IN WEIGHT

The steers made an unusually large gain during the first period. This is more remarkable because they had two weeks in which to fill previous to beginning the experiment. The gains were also quite good during the second and third periods. The lot fed dry beans made considerably more gain than either of the others.

HOGS FOLLOWING STEERS

Two hogs followed each lot of cattle, but the gains were too small to keep the hogs in good condition except those following the dry velvet-bean lot. These hogs had access to rye grazing in addition to the droppings.

SALE AND SLAUGHTER OF CATTLE

The steers were shipped to New Orleans, which is about 60 miles from McNeill, and sold there by a commission firm. The cottonseed-meal lot sold at $13 per 100 pounds, the dry-bean lot at $13.24, and the soaked-bean lot at $13.29. These prices corresponded to the relative finish as indicated by the dressing per cent for the different lots, which was 56.5, 57.1, and 57.8, respectively.

SUMMARY OF 1920 EXPERIMENT

Dry velvet beans produced greater gains than equal quantities of soaked beans (weighed dry), when fed with corn silage to fatten steers. In the soaked-bean lot 25 per cent more beans and 30 per cent more silage were required to make 100 pounds of gain. The rate of gain was 27 per cent greater on dry than on soaked beans. The profit on steers fed dry beans was 42 per cent greater than on steers fed soaked beans.

To produce 100 pounds of gain twice as much beans as cottonseed meal were required, but only two-thirds as much silage was required with the beans as with the cottonseed meal.

The results are recorded in Tables 14, 15, and 16.

TABLE 14.—*Average gains per steer, by periods and daily*

Lots and feeds	Gains by periods				Daily gains			
	First period	Second period	Third period	Total gain	First period	Second period	Third period	Average, 84 days
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Lot 1: Cottonseed meal	89	52	37	178	3.2	1.9	1.3	2.1
Lot 2: Dry velvet beans	114	57	64	235	4.1	2.0	2.3	2.8
Lot 3: Soaked velvet beans	93	46	49	188	3.3	1.6	1.7	2.2

TABLE 15.—*Total feed consumed per lot and daily feed per steer, by periods*

Lots and feeds	Total feed per lot				Daily feed per steer			
	First period	Second period	Third period	Total	First period	Second period	Third period	Average, 84 days
Lot 1:	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Cottonseed meal	1,152	1,470	1,650	4,272	4.1	5.2	5.9	5.1
Corn silage	12,405	15,000	15,120	42,525	44.3	53.6	54.0	50.6
Lot 2:								
Dry velvet beans	2,405	3,665	3,920	9,990	8.6	13.1	14.0	11.9
Corn silage	12,075	10,637	10,765	33,477	43.1	38.0	38.4	39.9
Lot 3:								
Soaked velvet beans	2,405	3,665	3,920	9,990	8.6	13.1	14.0	11.9
Corn silage	12,168	11,819	10,830	34,817	43.5	42.2	38.7	41.4

TABLE 16.—*Summary of feeds consumed, gains, costs,*[1] *and marketing data (1920)*

Item	Lot 1, cottonseed meal	Lot 2, dry beans	Lot 3, soaked beans
Number of steers	10	10	10
Days fed	84	84	84
Average daily ration:			
Cottonseed meal pounds	5. 1	----------	----------
Velvet beans do	----------	11. 9	11. 9
Corn silage do	50. 6	39. 9	41. 4
Total feed consumed per steer:			
Cottonseed meal pounds	427	----------	----------
Velvet beans do	----------	999	999
Corn silage do	4, 252	3, 348	3, 482
Feed per 100 pounds gain:			
Cottonseed meal do	240	----------	----------
Velvet beans do	----------	425	531
Corn silage do	2, 389	1, 425	1, 852
Initial weight per steer do	810	786	802
Final weight per steer do	988	1, 021	990
Total gain per steer do	178	235	188
Daily gain per steer do	2. 1	2. 8	2. 2
Cost of feed per steer dollars	33. 88	33. 37	34. 66
Cost of gain per 100 pounds do	19. 04	14. 20	18. 43
Initial value per 100 pounds do	9. 69	9. 69	9. 69
Necessary selling price to break even do	12. 37	11. 86	12. 30
Actual selling price do	13. 00	13. 24	13. 29
Profit per steer do	5. 85	13. 13	9. 27
Profit per steer including pork [2] do	6. 52	14. 93	10. 09
Expense of marketing do	3. 33	3. 33	3. 33
Pork produced per steer pounds	4. 5	12. 0	5. 5
Shrinkage to market do	53	70	50
Dressing percentage per cent	56. 5	57. 1	57. 8
Price received per ton for silage dollars	10. 75	15. 85	13. 33

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[1] Prices per ton of feed used: Corn silage, $8; dry velvet beans, $40; soaked velvet beans, $41.50; cottonseed meal, $79.

[2] The gains of the hogs were figured at the rate of $15 per 100 pounds.

THE 1921 EXPERIMENT

The object of this experiment was to compare dry whole velvet beans and cottonseed meal; dry whole velvet beans; and soaked whole velvet beans, when fed with corn silage. The lots were arranged as follows:

Lot 1. Cottonseed meal and dry velvet beans.
Lot 2. Dry velvet beans.
Lot 3. Soaked velvet beans.

KIND OF STEERS

In this experiment 30 very uniform 3-year-old grade Hereford and Shorthorn steers, cut from a herd of 200, were used. They were in good condition as they came from pasture near Crystal Springs, Miss. They had been running on stalk fields before being shipped on December 6. They arrived at McNeill on December 8, and were filled on velvet beans and hay. On December 9, they were branded, the first of three initial weighings taken, and the experimental feeding was begun. At this time they had lost 50 pounds per head from pasture weights at Crystal Springs.

OBSERVATIONS DURING EXPERIMENT

During the first 14 days all steers in the cottonseed-meal lot were off feed on account of eating spoiled silage which had been thrown into their lot as bedding. One steer was removed from the lot for two days and drenched at 12-hour intervals with 1-pound doses of Epsom salt. As a result of being off feed this lot made a very small daily gain for the period.

In the dry velvet-bean lot during the last period one bloated steer was given 1 pound of Epsom salt. On the following day he was in good condition.

QUANTITIES OF FEED CONSUMED

Equal quantities of beans were fed to lots 2 and 3, while lot 1 consumed about three-fourths as much beans as lot 2. The difference was offset by feeding lot 1, 1 pound of cottonseed meal for every 3 pounds of velvet beans fed to lot 2. The quantities of silage fed to each lot were practically the same. On account of the unusual amount of moldy silage which could not be fed, the supply gave out at the end of the third period. Consequently, all lots were fed cottonseed hulls. The quantities of beans fed were increased throughout the experiment whereas the quantities of roughage were decreased.

GAINS IN WEIGHT

The gains in weight were quite uniform in the lots except lot 1 during the first period and all lots during the third period. The cottonseed-meal lot gained considerably less than the dry and soaked bean lots in both the first and third periods.

In contrast to the first experiment at McNeill, the steers fed soaked beans in this experiment made slightly greater gains than those fed dry beans.

HOGS FOLLOWING STEERS

Because of the very small gains made by hogs in similar experiments previously no hogs were put in the lots in this experiment.

SALE AND SLAUGHTER OF CATTLE

The steers were shipped to New Orleans, 60 miles distant. The shrinkage in transit was very heavy for such a short distance, because they were delayed 24 hours by a freight wreck. On account of the narrow margin and the high cost of feed, there was a loss instead of a profit in feeding these steers.

SUMMARY OF 1921 EXPERIMENT

Ten per cent more feed was required to make 100 pounds gain with dry velvet beans than with soaked velvet beans.

In spite of the greater cost of soaked beans the gains made by steers fed dry beans cost 7 per cent more than the gains made on soaked beans.

As the gains were smaller and the cost of gain was greater there was no advantage in feeding cottonseed meal with dry velvet beans.

Tables 17, 18, and 19 give details of the experiment.

TABLE 17.—*Average gains per steer, by periods and daily*

Lots and feeds	Gains by periods [1]					Daily gains				
	First period [1]	Second period	Third period	Fourth period	Total gains	First period [1]	Second period	Third period	Fourth period	Average, 98 days
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Lot 1: Cottonseed meal and velvet beans	12	64	18	55	149	0.9	2.3	0.6	2.0	1.5
Lot 2: Dry velvet beans	29	62	24	49	164	2.1	2.2	.9	1.7	1.7
Lot 3: Soaked velvet beans	28	61	40	51	180	2.0	2.2	1.4	1.8	1.8

[1] The first period was 14 days, while the following periods were 28 days each.

TABLE 18.—*Total feed consumed per lot and daily feed per steer, by periods* [1]

Lots and feeds	Total feed per lot					Daily feed per steer				
	First period [1]	Second period	Third period	Fourth period	Total	First period [1]	Second period	Third period	Fourth period	Average, 98 days
Lot 1:	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Cottonseed meal	--------	280	280	280	840	--------	1.0	1.0	1.0	0.9
Dry velvet beans	665	1,550	2,455	2,970	7,640	4.7	5.5	8.8	10.6	7.8
Corn silage	4,621	13,509	11,741	--------	29,871	33.0	48.2	41.9	--------	30.5
Cottonseed hulls	--------	--------	--------	5,100	5,100	--------	--------	--------	18.2	5.2
Lot 2:										
Dry velvet beans	655	2,390	3,295	3,810	10,160	4.7	8.5	11.8	13.6	10.4
Corn silage	4,648	13,280	10,481	--------	28,409	33.2	47.4	37.4	--------	29.0
Cottonseed hulls	--------	--------	--------	5,039	5,039	--------	--------	--------	18.0	5.1
Lot 3:										
Soaked velvet beans	665	2,390	3,295	3,810	10,160	4.7	8.5	11.8	13.6	10.4
Corn silage	4,646	13,246	10,462	--------	28,354	33.2	47.3	37.4	--------	28.9
Cottonseed hulls	--------	--------	--------	5,033	5,033	--------	--------	--------	18.0	5.1

[1] The first period was 14 days, while the following periods were 28 days each.

TABLE 19.—*Summary of feeds consumed, gains, costs,*[1] *and marketing data* (*1921*)

Item	Lot 1, cottonseed meal-dry beans	Lot 2, dry beans	Lot 3, soaked beans
Number of steers	10	10	10
Days fed	98	98	98
Average daily ration:			
Cottonseed meal ... pounds	0.9	--------	--------
Velvet beans ... do	7.8	10.4	10.4
Cottonseed hulls ... do	5.2	5.1	5.1
Corn silage ... do	30.5	29.0	28.9
Total feed consumed per steer:			
Cottonseed meal ... do	84	--------	--------
Velvet beans ... do	764	1,016	1,016
Cottonseed hulls ... do	510	504	504
Corn silage ... do	2,987	2,841	2,835
Feed consumed per 100 pounds gain:			
Cottonseed meal ... do	56	--------	--------
Velvet beans ... do	513	620	564
Cottonseed hulls ... do	342	307	280
Corn silage ... do	2,005	1,732	1,575
Initial weight per steer ... do	839	840	841
Final weight per steer ... do	988	1,004	1,021
Total gain per steer ... do	149	164	180
Daily gain per steer ... do	1.5	1.7	1.8
Cost of feed per steer ... dollars	21.13	22.16	22.65
Cost of 100 pounds gain ... do	14.18	13.51	12.59
Expense of marketing per steer ... do	4.05	4.05	4.05
Initial value per 100 pounds ... do	7.73	7.73	7.73
Necessary selling price ... do	9.80	9.80	9.60
Actual selling price ... do	8.50	8.50	8.50
Loss per steer ... do	11.92	12.09	10.45
Shrinkage to market per steer ... pounds	69	74	65
Dressing percentage ... per cent	55.4	55.9	56.5
Hide weight per steer ... pounds	67	64	69
Amount lost per ton of silage ... dollars	2.98	3.51	2.39

[1] Prices per ton of feed used: Corn silage, $5; dry velvet beans, $23; soaked velvet beans, $24; cottonseed meal, $35; cottonseed hulls, $13.38.

THE 1922 EXPERIMENT

The object of this experiment was to compare cottonseed meal, dry whole velvet beans, and soaked whole velvet beans, when each was fed with sorgo silage to fatten steers. The lots were fed as follows:

Lot 1. Cottonseed meal.
Lot 2. Dry whole velvet beans.
Lot 3. Soaked whole velvet beans.

This was a duplication of the experiment of 1920, except that sorgo silage and no corn silage was fed.

KIND OF STEERS

Thirty grade Shorthorn, Hereford, and Angus steers, 3 to 4 years old (fig. 8), which had been fed various lengths of time on cottonseed meal and hulls, were shipped from Crystal Springs, Miss., on January 20 and arrived at McNeill 33 hours later. They shrank 45 pounds per steer in transit. Before the initial weights were taken they were given 150 pounds of hay and were watered. During the remainder of the three days when initial weights were being obtained they were fed 20 pounds of silage and 2 pounds of cottonseed meal per day.

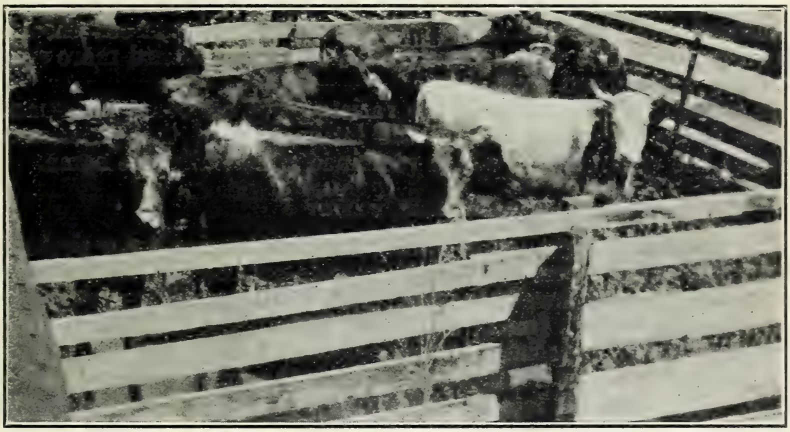

FIG. 8.—Grade southern Mississippi steers being fattened on soaked velvet beans, McNeill, April, 1922

FEEDS USED

During the last period it was necessary to use Osceola velvet beans, since no more Early Speckled beans could be obtained. (See fig. 3.) The Osceolas have much heavier pods and fewer beans in proportion to pod. Consequently, they were not so palatable nor so valuable for feed. The beans in this experiment were soaked 24 hours before feeding.

OBSERVATIONS DURING EXPERIMENT

During the first period of 14 days there was practically no fair weather. The steers were bedded with pine straw but the lots were in bad condition part of the time. The cottonseed-meal lot cleaned up their silage very readily, while the velvet-bean lots cleaned up slowly.

During the second period the velvet-bean lots continued to be slow in cleaning up their feed. During the third period the cottonseed-meal lot would have eaten considerably more feed, whereas the velvet-bean lots were slightly off feed. To correct this situation, their feed was reduced on March 10 for two days and then brought back to normal. One steer in the dry velvet-bean lot was bloated twice during the third period, but made a good gain.

In feeding Osceola beans it was evident that there was more advantage in soaking these thick-hulled beans than the Early Speckled variety, which have comparatively thin hulls. However, it was difficult to get the steers to eat a full feed of the Osceola beans; consequently a sprinkling of cottonseed meal was added to the rations of the bean lots to make them more palatable.

QUANTITIES OF FEED CONSUMED

As in the previous experiments the velvet-bean lots were fed equal quantities of velvet beans and silage. However, a deviation was made from this practice in the last period because the dry Osceola beans were so objectionable to the steers. Even the addition of cottonseed meal did not overcome the lack of palatability. The cottonseed-meal lot was fed one-half as much cottonseed meal as the velvet-bean lots were fed velvet beans and one-third more silage than the velvet-bean lots.

On account of the change in the variety of velvet beans the quantities of beans decreased during the latter part of the experiment, whereas the quantities of silage remained practically the same.

GAINS IN WEIGHT

The unusually large gains during the first period were probably largely fill, as the steers had lost 45 pounds per head in being shipped just before the initial weights were taken. The gains were very good in the second period, fair in the third, but during the fourth period they were small, especially in the cottonseed-meal lot. Hence the falling off in gains can not be wholly due to the substitution of Osceola beans. The bean-fed lots gained twice as much per head during the last period as the cottonseed-meal-fed lots.

In contrast to the previous two experiments, the steers fed cottonseed meal made a greater gain than those fed velvet beans.

MARKETING AND FINANCIAL OUTCOME

These steers were marketed in New Orleans and as the margin was over $2 per 100 pounds and feed costs were lower than in previous experiments, the feeding operation returned a small profit.

SUMMARY OF 1922 EXPERIMENT

To produce 100 pounds of gain 17 per cent more velvet beans and 13 per cent more sorgo silage were required when the beans were soaked than when they were fed dry.

The cost of 100 pounds gain made on soaked velvet beans was 18 per cent greater than that made on dry velvet beans.

In comparing dry velvet beans and cottonseed meal, it was found that twice as much velvet beans as cottonseed meal was required to produce 100 pounds of gain but only three-fourths as much silage was required.

The cost of 100 pounds gain from cottonseed meal and silage was about 10 per cent greater than the cost of gains of steers fed dry velvet beans and sorgo silage.

Tables 20, 21, and 22 give statistics of the experiment.

TABLE 20.—*Average gains in weight per steer, by periods and daily*

Lots and feeds	Gains by periods [1]					Daily gains				
	First period	Second period	Third period	Fourth period	Total gain	First period	Second period	Third period	Fourth period	Average, 98 days
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Lot 1: Cottonseed meal	39	75	74	14	202	2. 8	2. 7	2. 6	0. 5	2. 1
Lot 2: Dry velvet beans	57	62	43	35	197	4. 1	2. 2	1. 5	1. 2	2. 0
Lot 3: Soaked velvet beans	49	63	40	22	174	3. 5	2. 2	1. 4	0. 8	1. 8

[1] The first period was 14 days, the others 28 days each.

TABLE 21.—*Total feed consumed per lot and daily feed per steer, by periods* [1]

Lots and feeds	Total feed per lot					Daily feed per steer				
	First period	Second period	Third period	Fourth period	Total	First period	Second period	Third period	Fourth period	Average, 98 days
Lot 1:	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Cottonseed meal	600	1, 665	1, 680	1, 695	5, 640	4. 3	5. 9	6. 0	6. 1	5. 8
Sorgo silage	6, 126	14, 500	14, 040	14, 797	49, 463	43. 8	51. 8	50. 1	52. 8	50. 5
Lot 2:										
Cottonseed meal				210	210				[2] 1. 0	(2)
Dry velvet beans	1, 300	3, 160	3, 512	3, 062	11, 034	9. 3	11. 3	12. 5	10. 9	11. 3
Sorgo silage	5, 153	10, 553	10, 137	10, 254	36, 097	36. 8	37. 7	36. 2	36. 6	36. 8
Lot 3:										
Cottonseed meal				210	210				[2] 1. 0	(2)
Soaked velvet beans	1, 300	3, 160	3, 530	3, 421	11, 411	9. 3	11. 3	12. 6	12. 2	11. 6
Sorgo silage	5, 154	10, 524	10, 176	10, 078	35, 932	36. 8	37. 6	36. 3	36. 0	36. 7

[1] The first period was 14 days, the others 28 days each.
[2] Cottonseed meal was fed during the last 21 days.

TABLE 22.—*Summary of feed consumed, gains, costs,*[1] *and marketing data* (*1922*)

Item	Lot 1. Cottonseed meal	Lot 2. Dry beans	Lot 3. Soaked beans
Number of steers	10	10	10
Days fed	98	98	98
Average daily ration:			
Cottonseed meal ... pounds	5. 8	[2] 0. 2	[2] 0. 2
Velvet beans ... do		11. 3	11. 6
Sorgo silage ... do	50. 5	36. 8	36. 7
Total feed consumed per steer:			
Cottonseed meal ... pounds	564	21	21
Velvet beans ... do		1, 103	1, 141
Sorgo silage ... do	4, 946	3, 610	3, 593
Feed consumed per 100 pounds gain:			
Cottonseed meal ... do	279	11	12
Velvet beans ... do		560	656
Sorgo silage ... do	2, 449	1, 832	2, 065
Initial weight per steer ... do	773	770	773
Final weight per steer ... do	975	967	947
Total gain per steer ... do	202	197	174
Daily gain per steer ... do	2. 1	2. 0	1. 8
Cost of feed per steer ... dollars	23. 93	21. 32	22. 25
Cost of 100 pounds gain ... do	11. 84	10. 82	12. 79
Expense of marketing ... do	3. 20	3. 20	3. 20
Initial value per 100 pounds ... do	5. 92	5. 92	5. 92
Necessary selling price ... do	8. 11	7. 76	7. 99
Actual selling price ... do	8. 15	8. 11	8. 01
Profit per steer ... do	0. 30	3. 13	0. 16
Shrinkage to market ... pounds	77	64	56
Dressing percentage ... per cent	56. 8	57. 6	57. 5
Hide weight per steer ... pounds	67	65	63
Price received per ton of silage ... dollars	5. 12	6. 73	5. 09

[1] Prices per ton of feeds used: Sorgo silage, $5; dry velvet beans, $21.50; soaked velvet beans, $22.50; cottonseed meal, $41.
[2] Cottonseed meal was fed during last 21 days of experiment at rate of 1 pound per head per day.

CONCLUSIONS BASED ON EXPERIMENTAL WORK

Velvet beans and corn silage produce satisfactory gains for fattening steers. The ration is an economical one in regions in which the beans are grown.

Dry whole velvet beans are more economical for fattening steers than soaked whole velvet beans when the labor cost of soaking is taken into consideration.

The dry velvet beans in the pod make a palatable ration without soaking or grinding.

It is not economical to grind velvet beans for fattening steers. From 5 to 10 per cent less dry ground velvet beans than dry whole velvet beans are required to produce 100 pounds of gain, but the saving is not equal to the cost of grinding.

Both whole dry and soaked velvet beans are much more palatable than dry ground velvet beans. Ground velvet beans are so unpalatable that steers will not eat enough of them to make good gains.

Ground velvet beans heat quickly, become rancid, and mold readily.

Cottonseed meal increases the palatability of a ration of velvet beans.

Two pounds of velvet beans are practically equal to 1 pound of cottonseed meal for producing gain in fattening steers, and there is considerable saving in the amount of roughage required. However, cottonseed meal is a more palatable feed and produces more rapid gains.

For fattening steers velvet beans may be economically substituted for cottonseed meal when the price delivered at the farm does not exceed one-half the price of good-quality cottonseed meal.

Hogs do not make satisfactory gains from the droppings alone when following steers fed velvet beans in any form.

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May 22, 1925

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